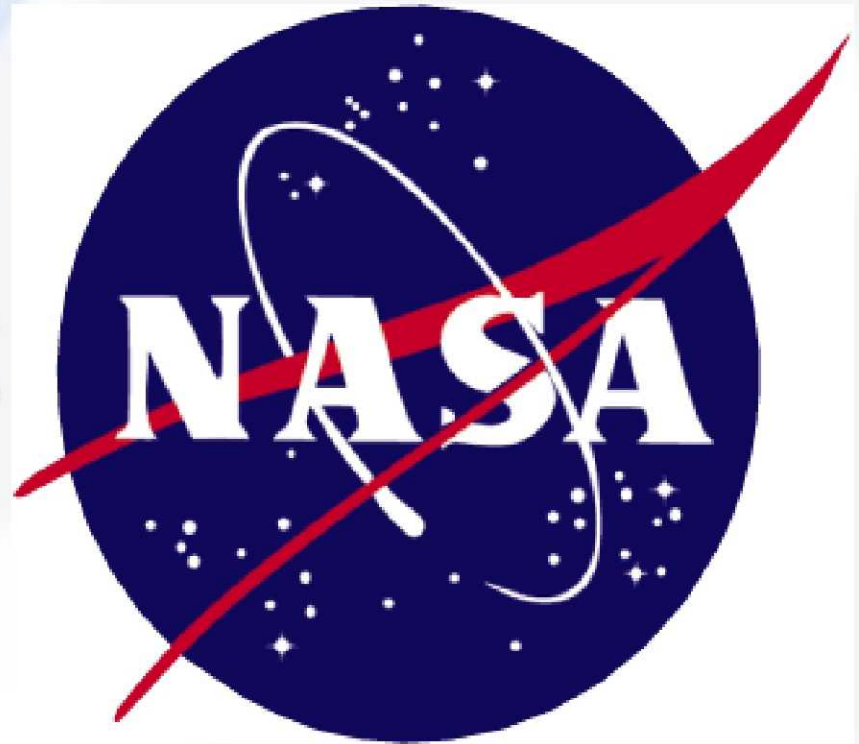


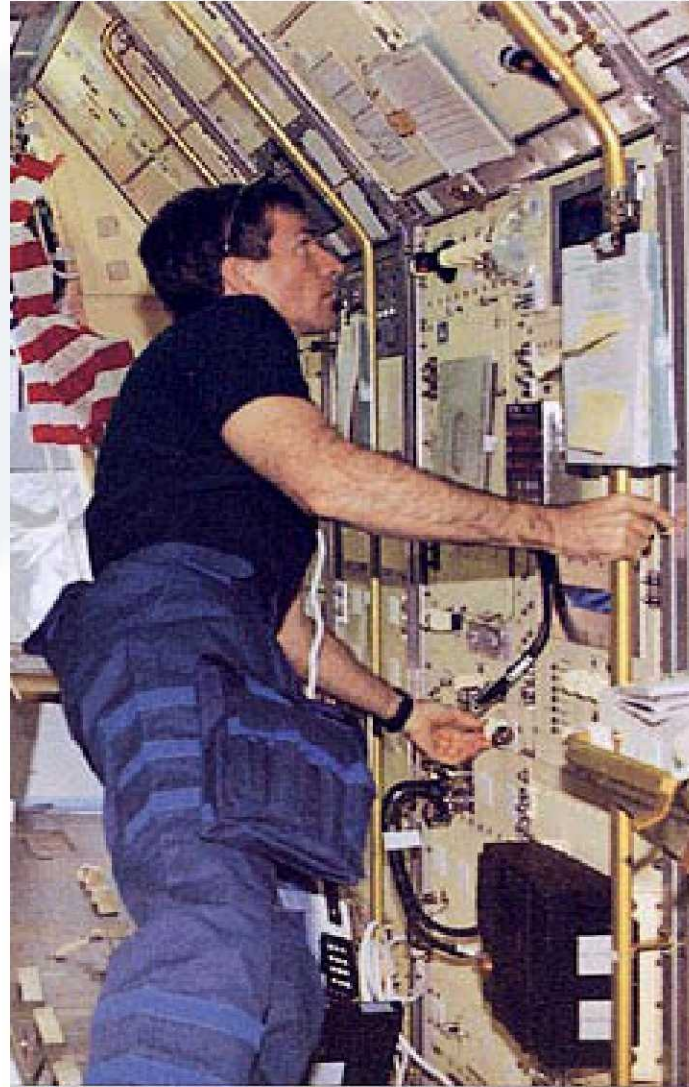
Innovation in Medicine: It's not Rocket Science



J.D. Polk, DO, MS, CPE, FACOEP
Chief, Space Medicine
NASA Johnson Space Center

Disclaimers

- We didn't invent Velcro.



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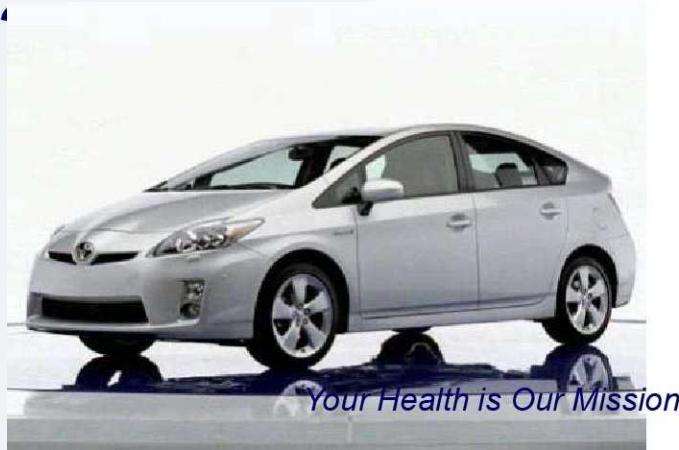
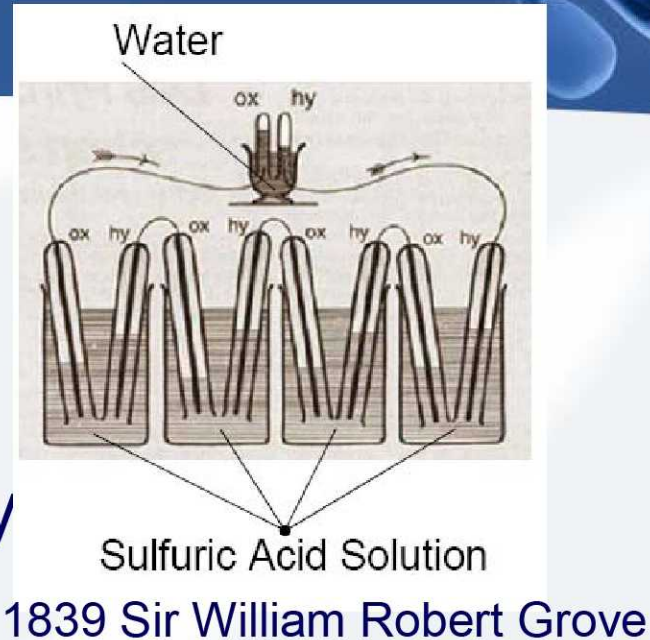
Disclaimers

- We didn't invent Tang either...



Innovation at NASA

- Sometimes we do invent stuff.
- But more often we take idea or products and modify it in ways folks did not imagine.
- When was the fuel cell invented?



United Tech
For the
Apollo
Program



Innovation at NASA



- Who invented solar energy? When?



1839 Antoine Cesar Becquerel

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Other examples of Innovation

- Who invented Stealth technology?



1964 Russian Physicist and Mathematician Pyotr Ufimtsev

Innovation



- Just what is ***Innovation***?
- Google “innovation” and you get 102,000,000 hits. By contrast, google “ethics” and you get 83,000,000 hits.
- Is it new ideas? Is it “out-of-the-box” thinking? Is it inventing that which has not been invented yet?
- Is it trying to stay fresh, ahead of the curve, anticipate the inflection point.

Because “The World Has Changed”

“Wealth in the new regime flows directly from *innovation*, not optimization; that is wealth is not gained by perfecting the known, but by imperfectly seizing the unknown”.

- Kevin Kelly,
New Rules for the New Economy, *Wired*

A New Way of Doing Something



“The term **innovation** refers to a new way of doing something. It may refer to incremental and emergent or radical and revolutionary changes in thinking, products, processes, or organizations”.

- Wikipedia

Ideas are the Most Important

"Capital isn't so important in business. Experience isn't so important. You can get both these things. What is important is ideas. If you have ideas, you have the main asset you need, and there isn't any limit to what you can do with your business and your life."

— Harvey Firestone



Letting go of the old formula...



"It's easy to come up with new ideas; the hard part is letting go of what worked for you two years ago, but will soon be out of date."

— Roger von Oech

Top Barriers to Innovation



- 10) Criticize new ideas
- 9) “Not invented here” phenomenon
- 8) Treat brainstorming like a 60’s sit-in
- 7) Focus on efficiency, not innovation
(although you can use innovation to become more efficient)
- 6) Hoarding problems, hoarding resources, hoarding ideas

Top Barriers to Innovation



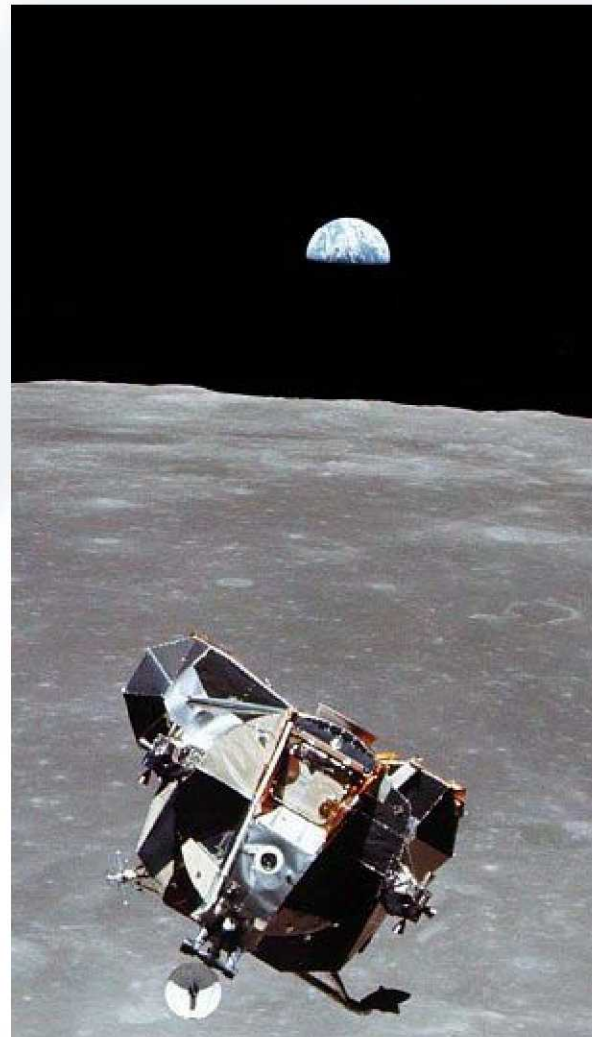
- 5) Punish mistakes
- 4) Promote the clones
- 3) Diminish training and education
- 2) Overwork the few

Number 1 Barrier to Innovation



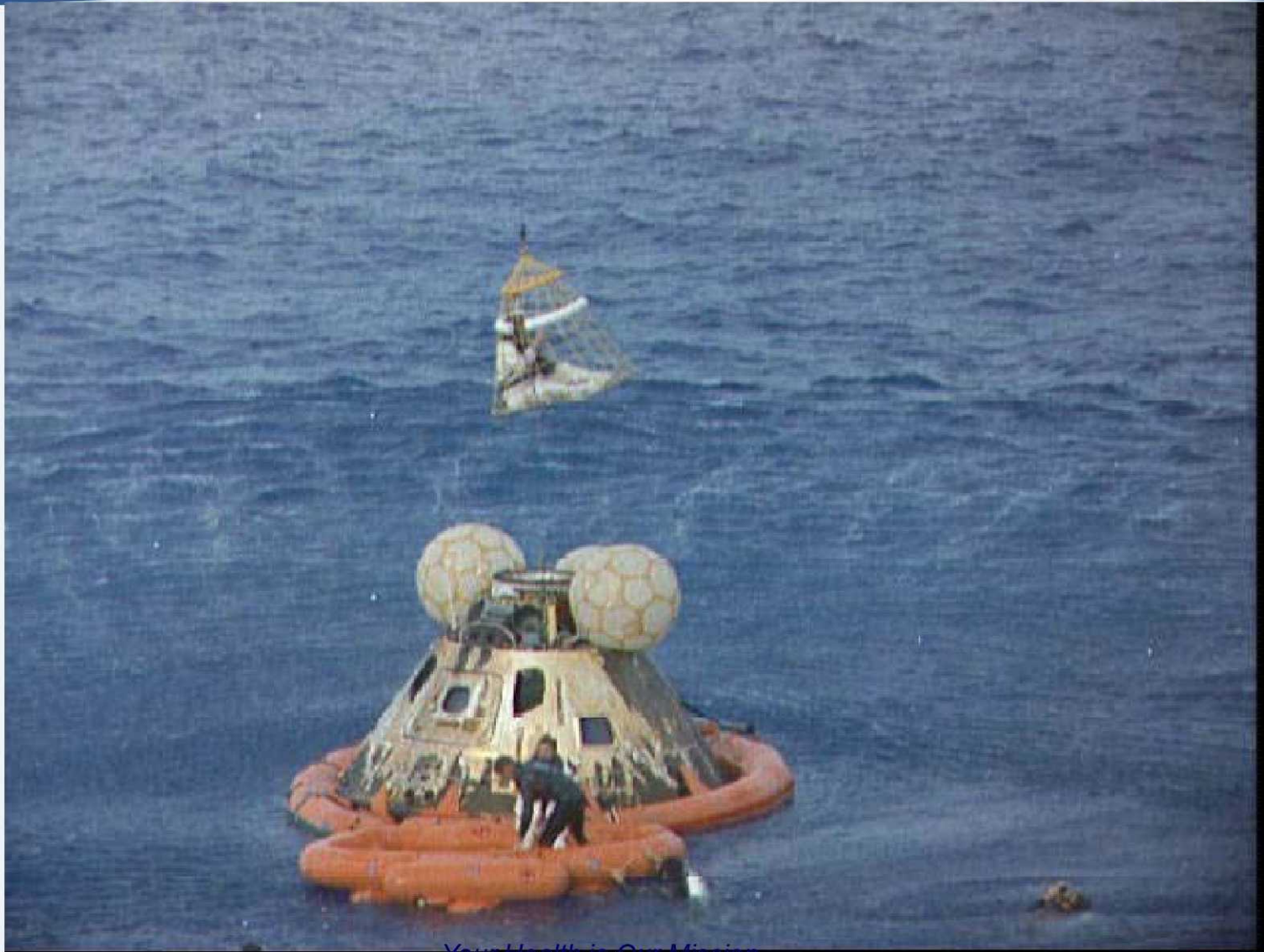
1) “It’s the way we
have always
done it”.

NASA and Innovation



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NASA and Innovation

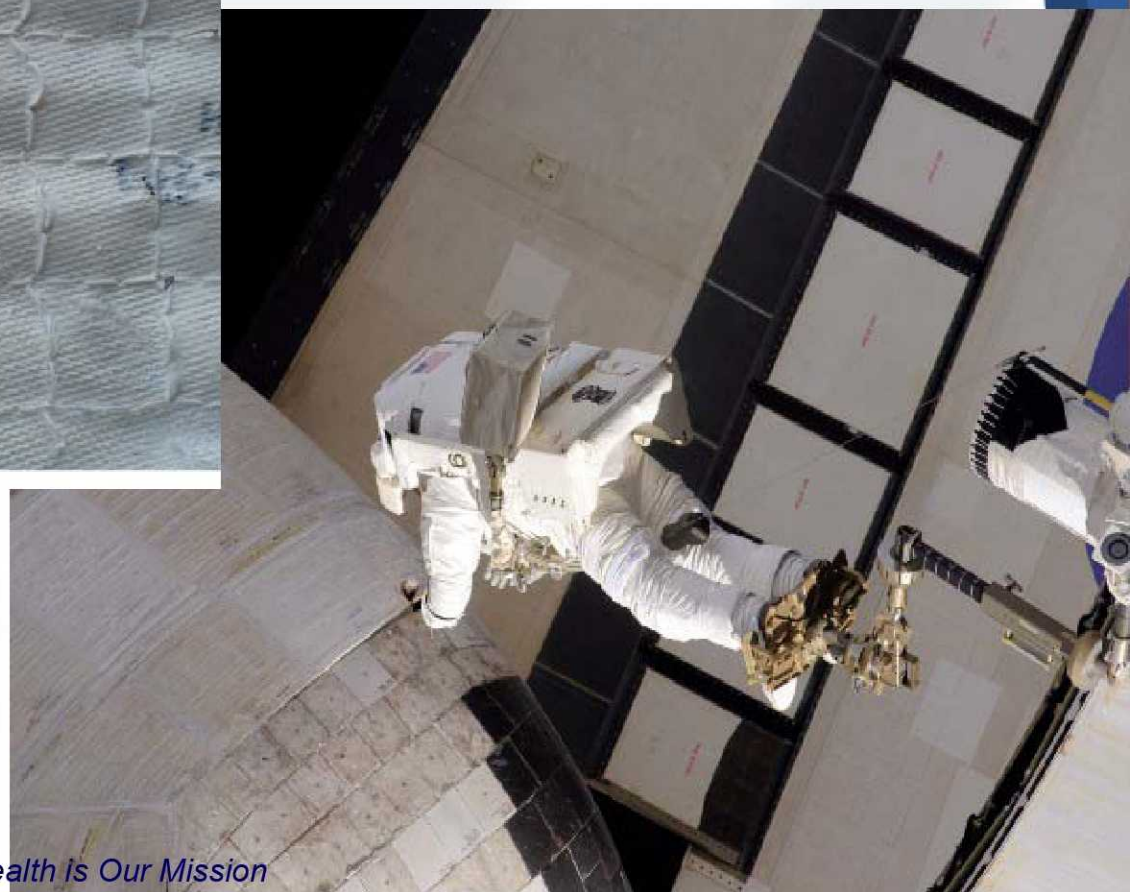


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Being Inclusive- Team 4 Innovation



ISS015E12229



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ISS015E12943

The SIX Tenets

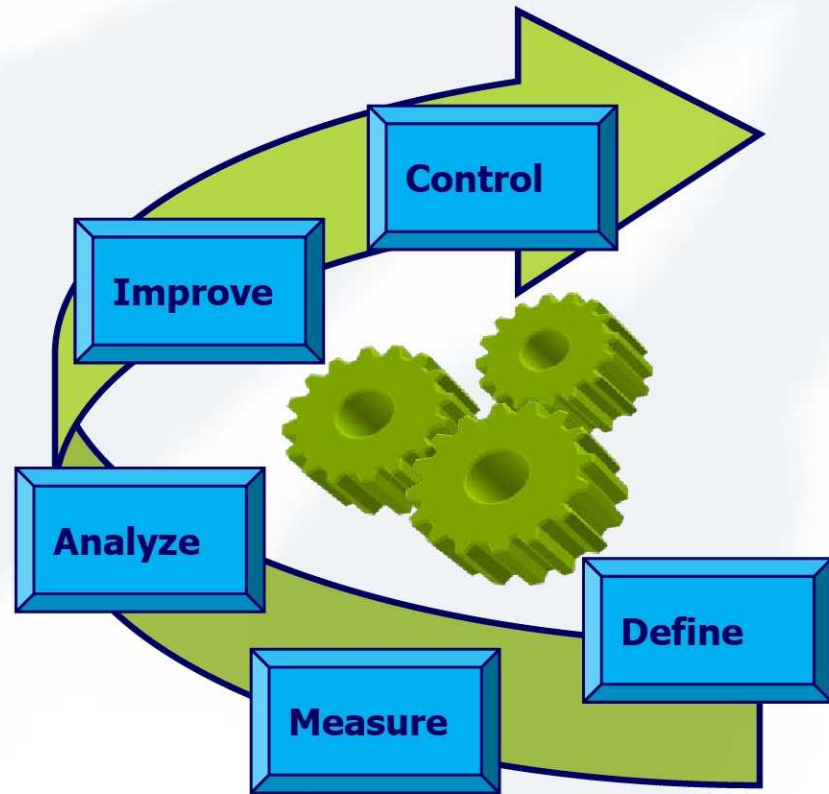
- MASS
- POWER
- VOLUME
- TIME
- MONEY
- RISK

Polk's Law: If you want your medical project to succeed, it should not increase more than two of these, and preferably should reduce at least one.



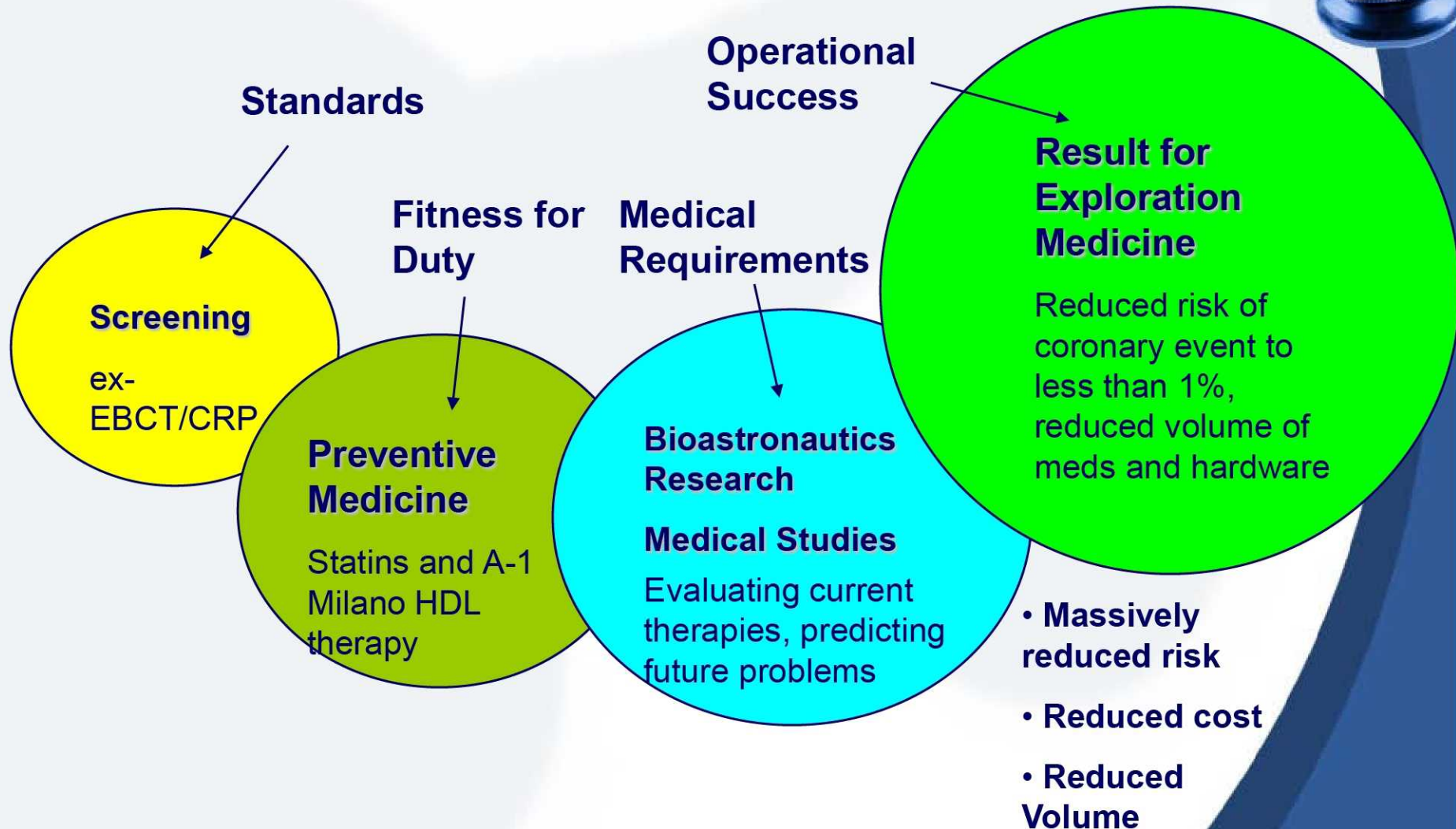
Lean Six Sigma

- Clinical Practice Guidelines
- Care Managers
- Selection Standards
- Vehicle specific standards
- Fitness for Duty Standards

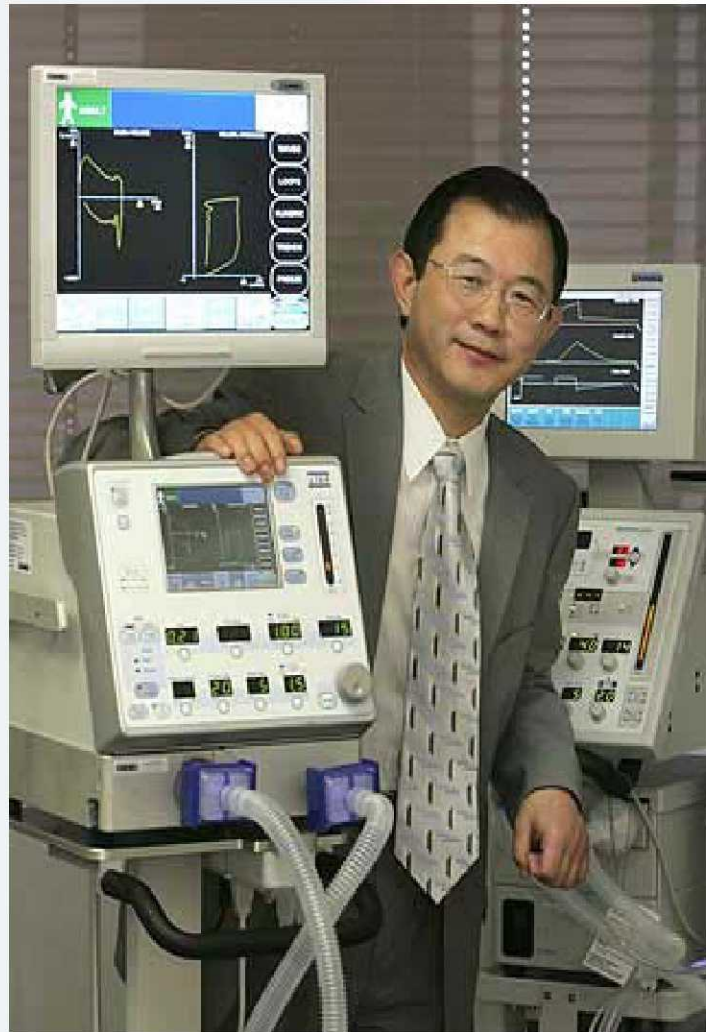


Preventive Medicine

Practicing Offensive Preventive Medicine

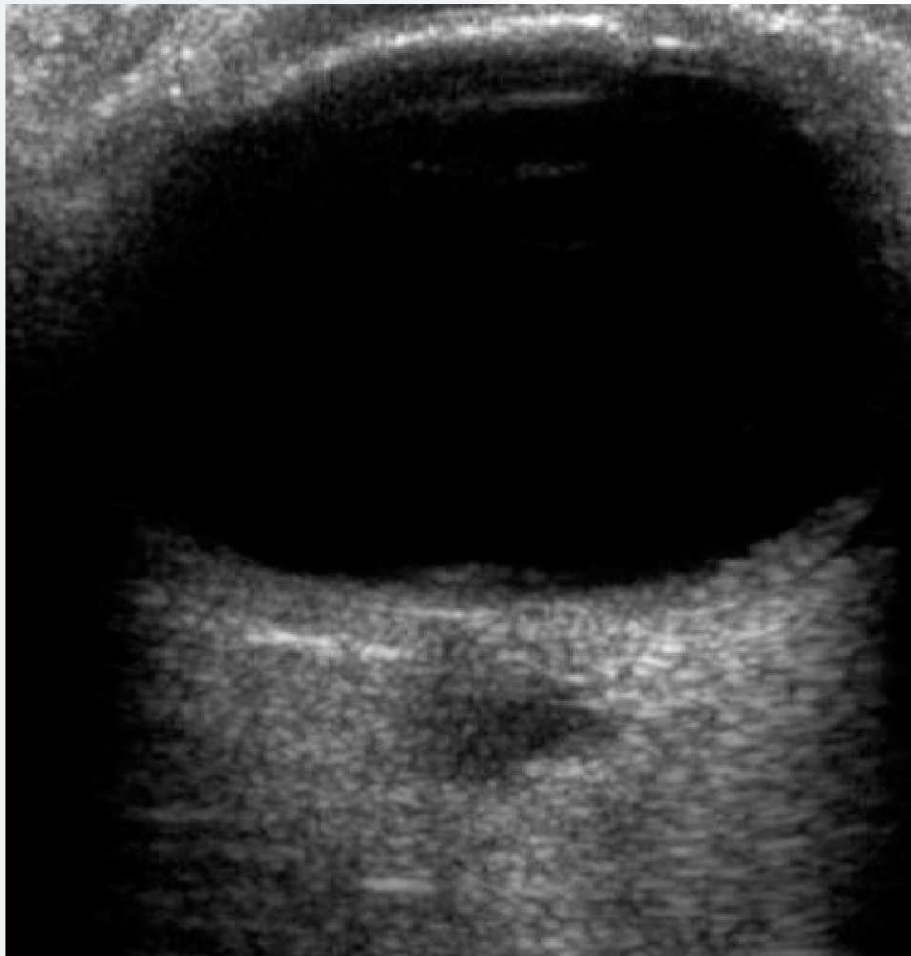


Medical Innovation at NASA



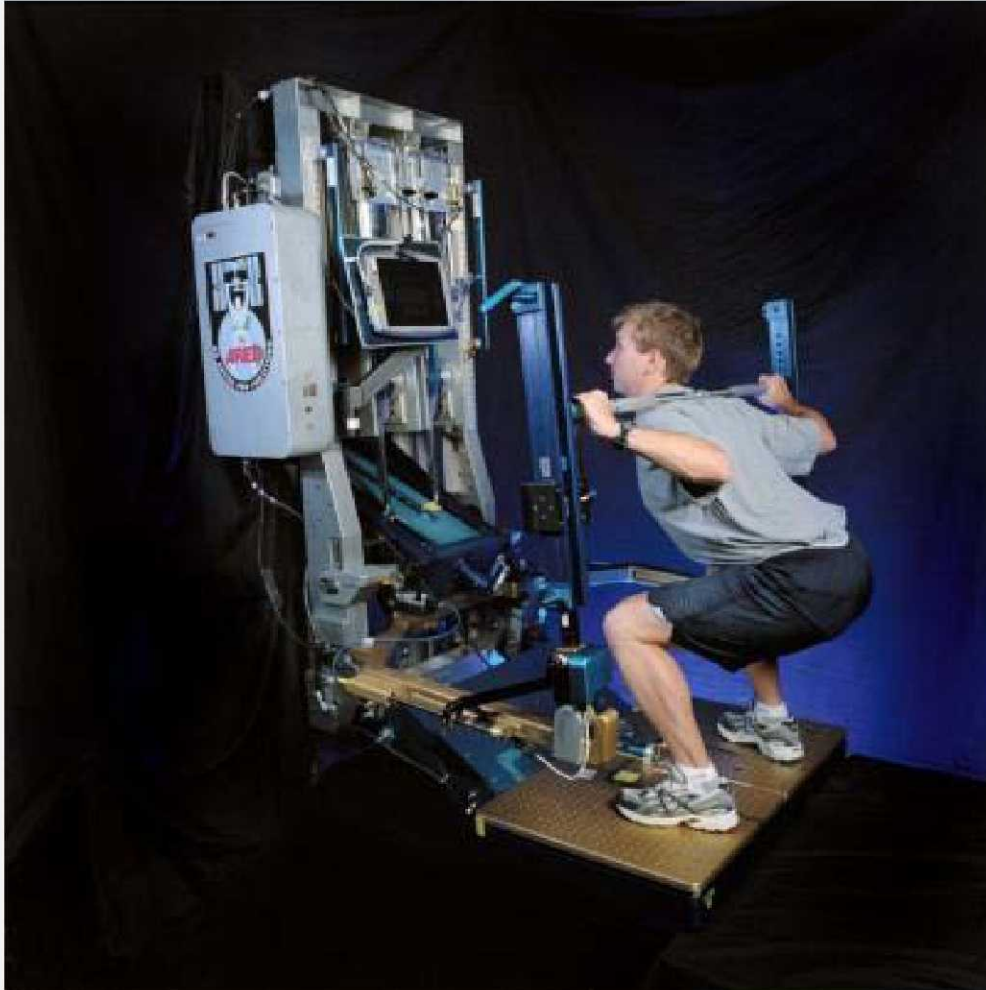
- Closed Circuit
- Oxygen Concentrating
- Computer controlled

Medical Innovation at NASA



- New uses for ultrasound
- New protocols for ultrasound
- New techniques in remote and telemedicine uses of ultrasound

Medical Innovation at NASA



- New exercise equipment that monitors loading on muscle and bone
- Equipment that provides valuable metrics on strength and duration

PanOptic Hardware Innovation



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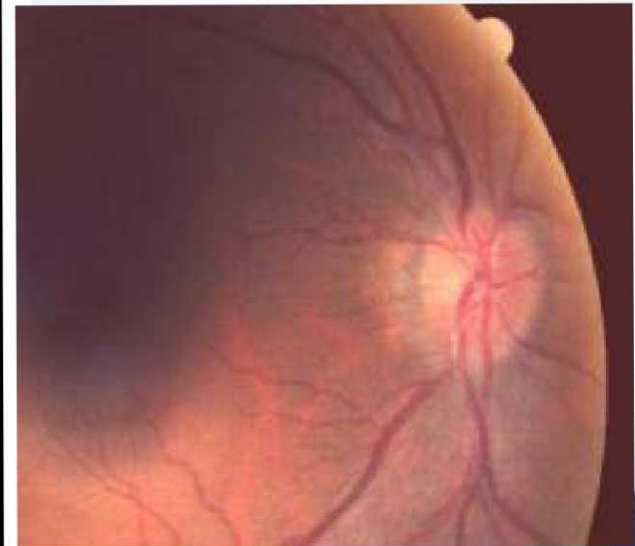
Provizion

Dr. Paul Filar

0:13 / 5:33

807 views

☆☆☆☆☆ 0 ratings



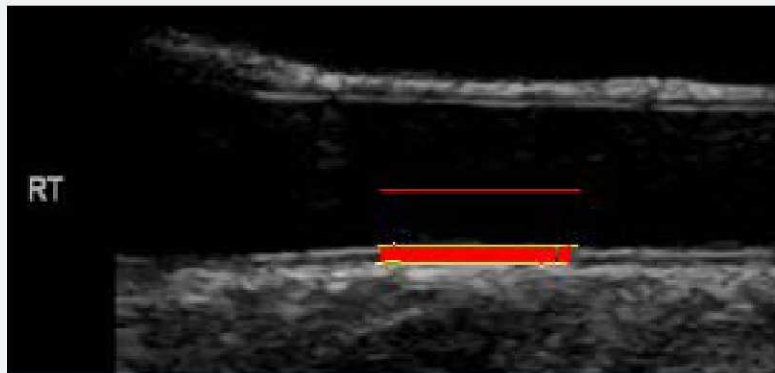
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Medical Innovations at NASA



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Medical Innovations coming from NASA technology



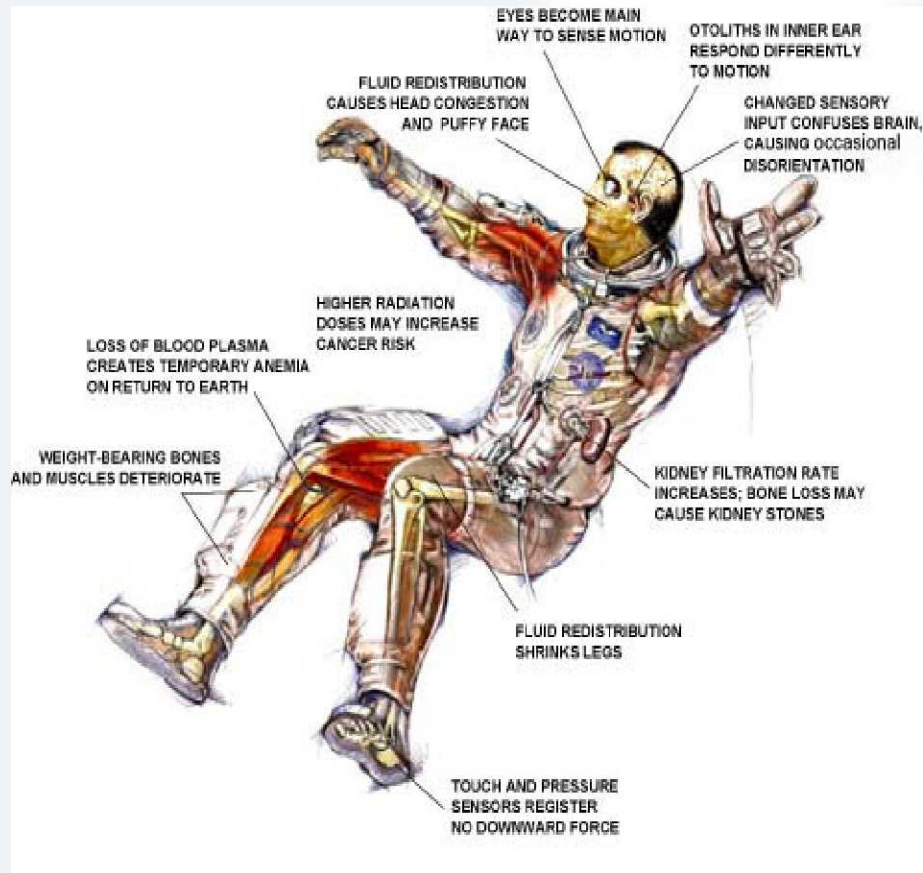
- JPL software used to study subpixel images of planets (can distinguish 256 shades of gray at the micro pixel level)
- Tech used from Carotid Intima-Medial Thickness ultrasound to evaluate plaque.

Arteriovision CIMT

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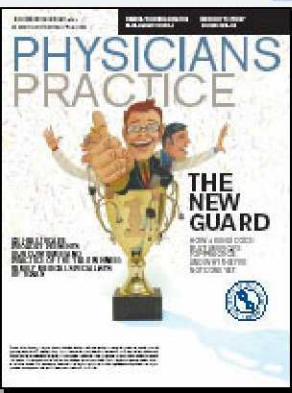
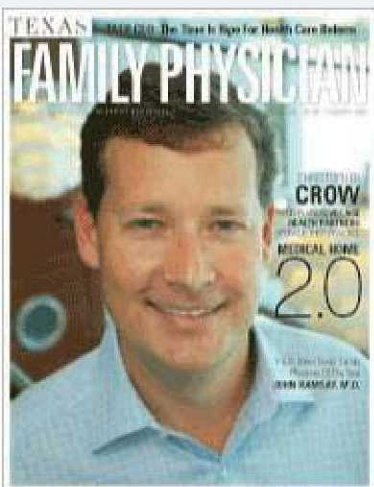
Open Source for Innovation



- DigitalHuman
- University of Mississippi Medical Center
- Open source code uses innovation from programmers on the outside to improve the modeling and code

From Scientific American

Benchmarking



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Benchmarking

- Astronaut Health Care
- Executive Health Physicals
- Occupational Surveillance
- Studies on Aging



Medical Innovation at NASA



Photo by google.com

**Global
Standardized
Medical
Records
Access
Using the
“Cloud”**

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Contingency Innovation



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Innovative Marketing



twitter

Google™

facebook

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Innovation and Education

HUNCH—High Schools United with NASA to Create Hardware

Need:

CHeCS rack in
SSTF

Challenge:

Cost prohibitive

Approach:

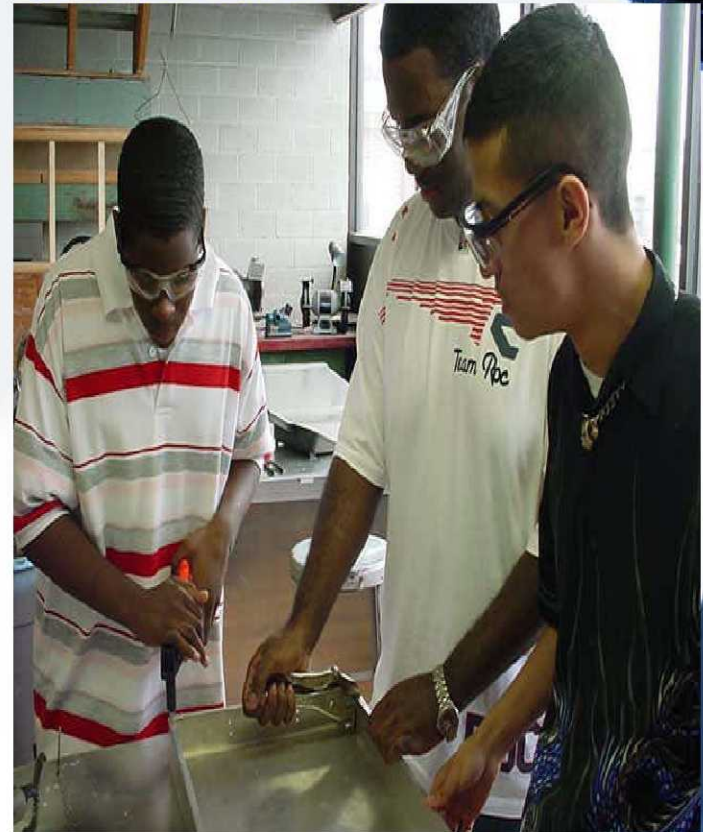
Partner with local
high schools

Result:

Racks delivered

Students
prepared for
careers and
college

Additional
projects
completed
(TVIS and ARED)



Futuristic?



CPD, NASA AMES



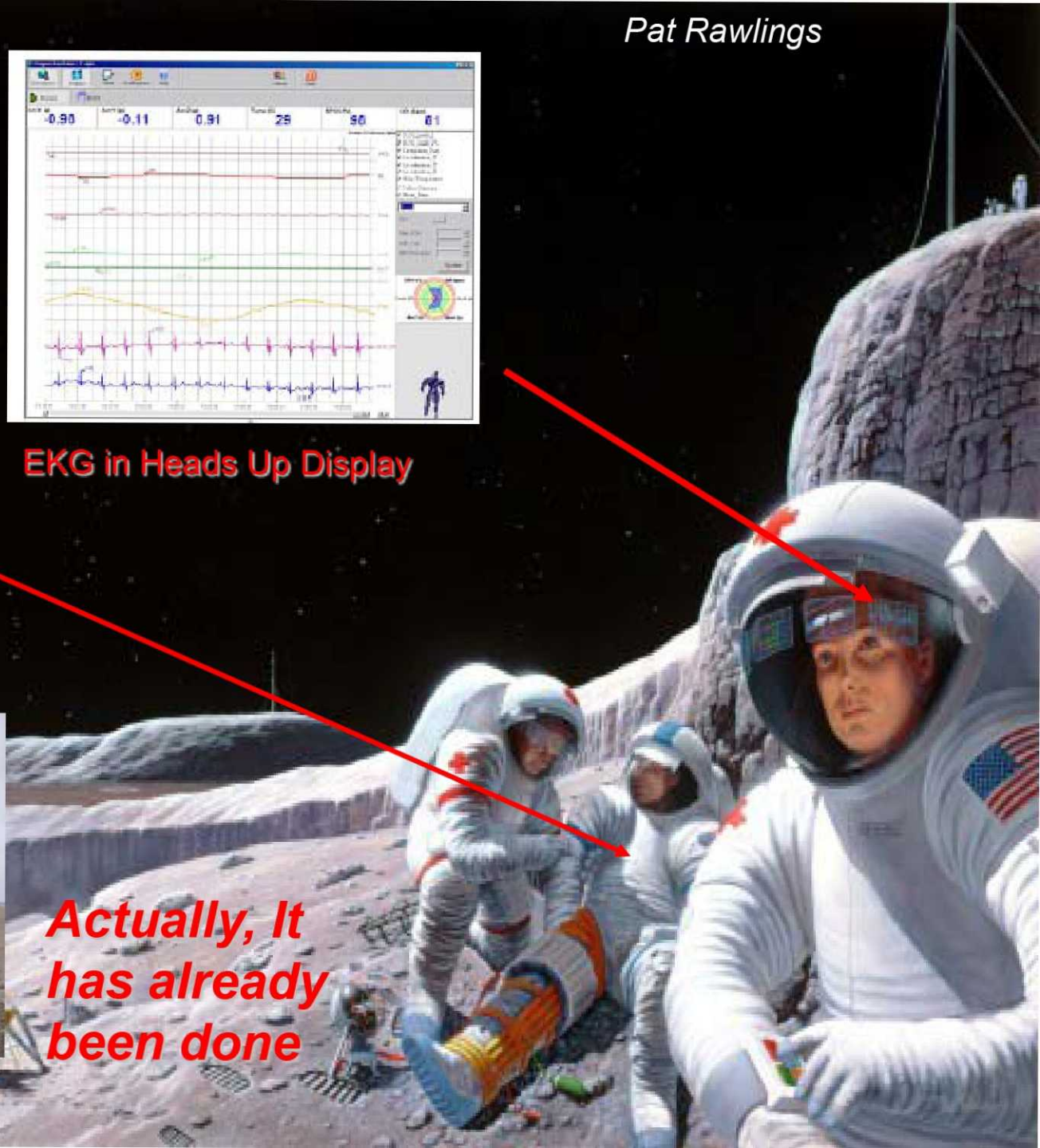
EKG in Heads Up Display



NASA Houghton Mars Project

Oct 2009 Polk

**Actually, It
has already
been done**



*Metrics...because Innovative ideas
without outcomes are just ideas...*



- Time Saved
- Money Saved
- Quality Improvement
- Process Improvement
- New Business

Forecasting and Responding to Inflection Points

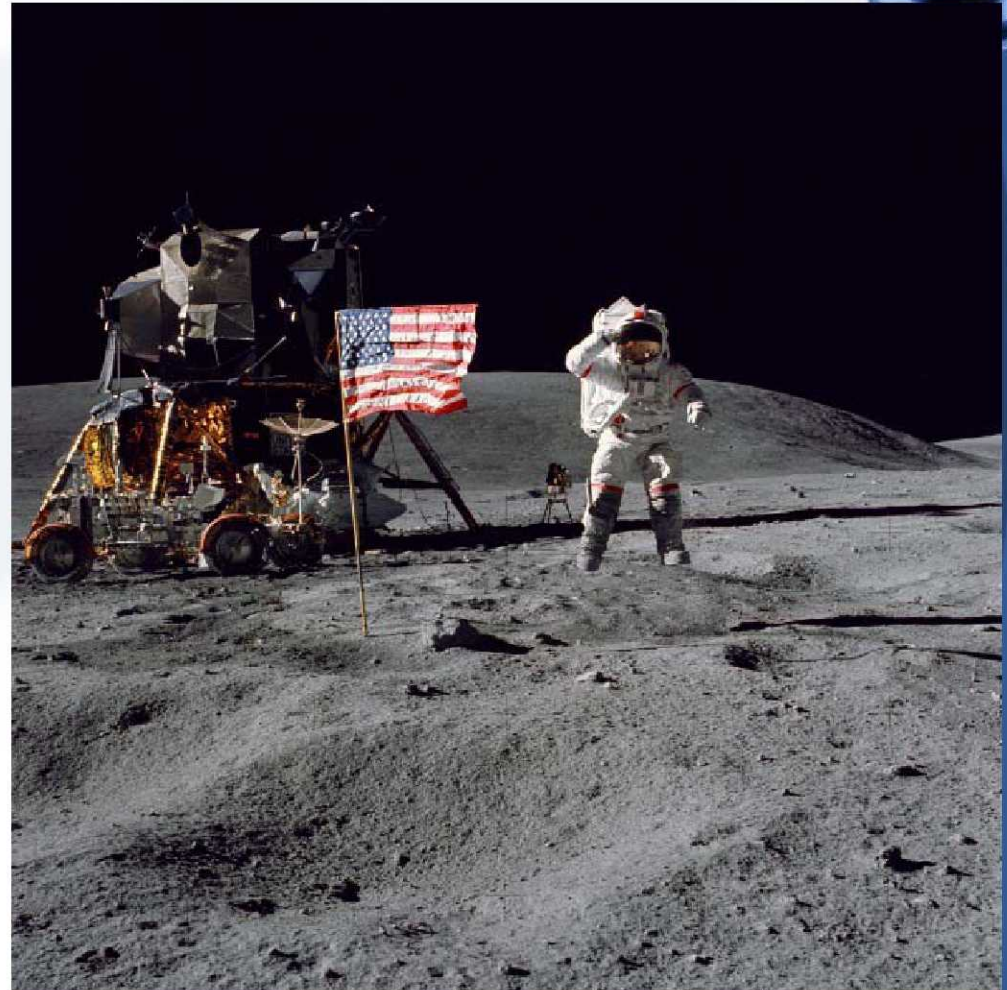


- Technology
- Changes in Practice
- Changes in Funding
- Changes in Destination
- Changes in Mission
- Changes in Management

Unique Aspects of Moon and Mars Missions



- Distance
- In-situ production of consumables
- Relative Autonomy
- Communication
- Power production
- *Reversal of Life, Limb, Mission paradigm*



It's not the Destination...it's the Journey that causes us to Innovate



Ok...maybe it's both. But avoid complacency.

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Leadership and Innovation



“Innovation distinguishes between a leader and a follower”.
- Steve Jobs

*The death of your industry begins
when innovation stops...*



**“Without tradition, art is a flock of sheep
without a shepherd. Without innovation
it is a corpse”.**

– Winston Churchill

The image shows the USS Enterprise (NCC-1701-A) in orbit above Earth. The ship is a silver, saucer-shaped vessel with a blue glowing nacelle. It is positioned in the upper right quadrant of the frame, angled towards the viewer. The Earth's surface is visible below, showing a mix of blue oceans and white, swirling clouds. The horizon line of the planet curves across the middle of the image, separating the dark space above from the bright atmosphere below.

Questions?